

# **ELECTROCHEMICAL SYSTEM FOR ANALYZING PERFORMANCE AND PROPERTIES OF ELECTROLYTIC SOLUTIONS**

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## **Abstract Of The Invention**

The invention relates to the analysis of the performance and properties of electrochemical processes, and specifically, to electrolytic solutions and electrode processes. The invention discloses a device and a method for obtaining qualitative and quantitative information for the kinetics of the electrode reactions, the transport processes, the thermodynamic properties of the electrochemical processes taking place in the cell. When a deposition reaction takes place, the device provides also valuable information about the relationship between the current density and deposit properties including but not limited to the deposit color, luster, and other aspects of its appearance. The device disclosed herein typically is comprised of a multiplicity of cathodic or anodic regions where one or more electrochemical reactions take place simultaneously, but at a different rate. From the precisely measured segmental currents one can obtain among other process properties: (1) An accurate relationship between the deposit appearance and the current density. This relationship can be used for process diagnostics, troubleshooting, control of concentrations, pH, and additives and contaminants and for optimizing the operating conditions, including the voltage, current, and circulation rate. (2) Quantitative determination of important process parameters including but not limited to, kinetics (e.g., exchange current density, cathodic and anodic transfer coefficients), transport (e.g. conductivity), and thermodynamics (e.g., standard potential). A particularly attractive application of the process is for the quantitative and qualitative processes of alloys plating and for the determination of the relationship between the current efficiency and the applied current density.